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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
TUGBANG, ANTHONY D	
ART UNIT	PAPER NUMBER
3729	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/29/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	09/588,788	HSU ET AL.	
	Examiner	Art Unit	
	A. Dexter Tugbang	3729	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-8 and 16-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1,4-8 and 16-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The applicant(s) amendment filed on November 10, 2006 has been fully considered and made of record.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 23 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In Claim 23, the limitations of "said center of said spiral consists of said dielectric layer" (lines 1-2) are new matter. The specification and drawings, as originally filed, do not provide support for the center of the spiral consisting of only the dielectric layer.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

5. Claim 23 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In Claim 23, it is unclear from the disclosure as to how the center of the spiral consists of the dielectric layer. How is this possible? The phrase of "said center of said spiral consists of said dielectric layer" (lines 1-2) is confusing and very misleading.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1, 4 through 6, 8 and 16 through 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haas 4,016,519 in view of Imai 5,834,825.

Haas discloses a method for fabricating an integrated circuit inductor comprising: providing a substrate (e.g. 3 in Fig. 1); forming over the substrate a planar spiral conductor layer (e.g. 1) comprising a single spiral to form a planar spiral inductor, wherein a successive series of loops within the planar spiral conductor layer is formed with a progressive and discontinuous variation progressing from a center of the spiral defined by a first loop to a periphery of the series of loops.

The successive series of loops forms a uniform ellipse and the series of loops forms progressive stepwise changes in line widths to form a series of discrete line widths for the successive series of loops (see Fig. 1).

Regarding Claim(s) 6, 16 and 18, Haas further teaches that the first loop defines the center of the spiral with a comparatively narrow line width and the final loop defines a perimeter

with a comparatively wide line width where the progressive and discontinuous variation comprises progressively increasingly stepwise changes (see col. 2, lines 38-40).

Regarding Claim(s) 8, Haas shows that the successive series of loops comprises a single spiral of 7 loops.

Haas teaches substantially all of the limitations of the claimed manufacturing method except that the substrate comprises a dielectric layer over a semiconductor substrate (as required in each of Claims 1 and 4).

Imai shows that it is known to manufacture planar inductors by forming a substrate with a dielectric layer (e.g. 11 in Fig. 5A) over a semiconductor substrate (e.g. 10) for several associated advantages. These advantages include:

1) to provide support for the planar spiral conductor layer (e.g. 12a) in the final structure;

2) to provide a degree of electrical isolation between the inductor and the planar spiral conductor layer (col. 2, lines 61-64); and

3) to allow accurate fine patterning of the planar spiral conductor layer (col. 2, lines 65-67).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the substrate of Haas by forming it with a dielectric layer over a semiconductor substrate, as taught by Imai, for anyone of, or all of, the associated advantages explicitly stated by Imai.

Regarding Claim(s) 5, Haas does not appear to mention that the planar spiral conductor layer is formed of a conductor material that is a non-magnetic metal. However, the examiner takes Official Notice that forming a planar spiral conductor layer with a non-magnetic metal is

conventional, old, and notoriously well known in the art of forming inductors. As evidence of obviousness, the examiner cites Wollnik (U.S. Patent 4,187,485, col. 3, lines 30+) to show that a conductor material of a non-magnetic material (e.g. copper) can be used as the material for a spiral conductor layer. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Haas by utilizing a conventional non-magnetic metal of copper, as taught by Wollnik, for the advantages of inducing a magnetic field during operation of the inductor.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haas in view of Imai, as applied to Claims 1 and 6 above, and further in view of Murphy 5,844,451 and Esper et al 4,613,843.

Haas, as modified by Imai, discloses the claimed manufacturing method as relied upon above for Claims 1 and 6. The modified Haas method does not mention that the comparatively narrow line width is from 7 to 10 microns and that the comparatively wide line width is from about 17 to 21 microns.

Murphy teaches that line widths can be formed to dimensions up to 25 microns (col. 3, lines 62-64).

Esper teaches that line widths can be formed to dimensions of at least 4 microns.

Murphy and Esper show that comparative line widths of a planar spiral conductor can be formed between 4 to 25 microns as the values in between this range would be inclusive of the claimed ranges of 7 to 10 microns and 17 to 21 microns.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method Haas by forming the planar spiral conductor

layer to a comparatively narrow line width from 7 to 10 microns and a comparatively wide line width from about 17 to 21 microns, as taught by Murphy and Esper, to perform the very same purpose of providing a planar spiral conductor layer to induce a magnetic field.

Alternatively, since Murphy and Esper teach upper and lower values for line widths of the planar spiral conductor layer, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have formed the spiral conductor layer of Haas with a comparatively narrow line width from 7 to 10 microns and a comparatively wide line width from about 17 to 21 microns, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

9. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haas in view of Imai, as applied to Claim 1 above, and further in view of Romankiw et al 4,295,173 and Esper 4,613,843.

Haas, as modified by Imai, discloses the claimed manufacturing method as relied upon above for Claim 1 further including that the series of loops of Haas can be formed any other types of shapes (col. 2, lines 22-25). The modified Haas method does not mention that one of those shapes can be a rectangle.

To form the planar spiral conductor layer is a series of loops with the shape of a rectangle is notoriously well known for the very same purpose of providing inductance with a Q value, or effecting the magnetic field, during operation. As evidence, the examiner cites Romankiw and Esper, each having rectangular shaped series of loops for the planar spiral conductor layer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Haas by forming the series of loops with a rectangular shaped series, as taught by Romankiw and Esper, to perform the very same function of effecting the magnetic field and Q value of inductance during operation.

10. Claims 19 through 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of the following four references:

a) Haas 4,016,519,

b) Church et al 4,219,584,

c) Imai 5,834,825, and

d) Wollnik 4,187,485.

Regarding Claim(s) 19 through 22, Haas teaches substantially all of the limitations of the claimed manufacturing method (as noted above) except for: 1) the substrate comprising a dielectric layer over a semiconductor substrate; and 2) that the variation comprises a series of progressive stepwise changes in spacings separating the successive series of loops.

Church discloses a method of making a planar inductor comprising: providing a substrate (e.g. 10 in Fig. 1); forming over the substrate a planar spiral conductor layer (e.g. 20) comprising a single spiral to form a planar spiral inductor, wherein a successive series of loops within the planar spiral conductor layer is formed with a progressive and discontinuous variation progressing from a center of the spiral defined by a first loop to a periphery of the series of loops.

Church further teaches that the successive series of loops forms a uniform elliptical shape and the series of loops forms progressive stepwise changes in line widths to form a series of discrete line widths for the successive series of loops (see Fig. 2). The first loop of Church

defines the center of the spiral with a comparatively narrow line width and the final loop defines a perimeter with a comparatively wide line width where the progressive and discontinuous variation comprises progressively increasingly stepwise changes along a vertical cross-section (see col. 2, lines 17+).

As with Haas, Church also does not teach: 1) that the substrate comprising a dielectric layer over a semiconductor substrate; and 2) that the variation comprises a series of progressive stepwise changes in spacings separating the successive series of loops.

Imai shows that it is known to manufacture planar inductors by forming a substrate with a dielectric layer (e.g. 11 in Fig. 5A) over a semiconductor substrate (e.g. 10) for several associated advantages. These advantages include:

1) to provide support for the planar spiral conductor layer (e.g. 12a) in the final structure;

2) to provide a degree of electrical isolation between the inductor and the planar spiral conductor layer (col. 2, lines 61-64); and

3) to allow accurate fine patterning of the planar spiral conductor layer (col. 2, lines 65-67).

Regarding Claim(s) 23 as best understood, the dielectric layer can alternatively be read as layer 12b, 21, which is formed to make up the center of the spiral (see Fig. 5B or 5C).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the substrate of either Haas or Church by forming each of their substrates with a dielectric layer over a semiconductor substrate, as taught by Imai, for anyone of, or all of, the associated advantages explicitly stated by Imai.

Wollnik teaches that a series of loops separated by spacings can have a stepwise change in the variation of the spacings (see Figs. 6 and 7). Note the cross-sectional view (in Fig. 7) of Wollnik where the spacing between each of the loops changes in a decreasing variations (from left to right) or in an increasing stepwise variation (from right to left). The changes in spacing are based upon magnetic field intensity and current density (col. 2, lines 37+ and Figs. 2a, 2b) desired for the inductor.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of either Haas or Church, by changing the variation of spacings between the loops in a series of loops in a stepwise change, as suggested by Wollnik, for the purpose of having a desired magnetic field intensity and current density of the inductor device.

Response to Arguments

11. The applicant(s) arguments filed on November 10, 2006 have been fully considered but they are not persuasive.

In regards to the merits of Haas, the applicant(s) argue that Haas does not teach 1) an integrated circuit planar inductor, 2) a dielectric layer over a semiconductor substrate, 3) a planar spiral inductor, and 4) a series of progressive stepwise changes in line widths.

The examiner most respectfully disagrees. Haas explicitly mentions an integrated circuit planar inductor (col. 1, line 6). Moreover, the inductor Haas is planar to the extent shown in Figure 1 and the stepwise changes in line widths are explicitly stated at col. 2, lines 38-40. With respect to the dielectric layer, this feature was relied upon in Imai. It is noted that in Claims 1

and 4, Haas does not have to meet the limitations of a "series of progressive stepwise changes in spacings separated by the successive series of loops", due the alternative language of "one of" (line 14 of Claim 1 and line 13 of Claim 4).

In response to applicant's arguments that the combination of the prior art noted in the previous Office Action or above, cannot be combined because of different structures or different teachings, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). It is well worth noting that all of the reference above share the very same problems associated with forming spiral conductor layers over a substrate.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Dexter Tugbang whose telephone number is 571-272-4570. The examiner can normally be reached on Monday - Friday 7:30 am - 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Vo can be reached on 571-272-4690. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A. Dexter Tugbang
Primary Examiner
Art Unit 3729

January 18, 2007